IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
BAGNI ET AL.

Serial No. **Not yet assigned**

Filing Date: **Herewith**

For: **PROCESSING OF MOTION VECTOR HYSTOGRAMS FOR RECOGNIZING THE INTERLEAVED OR PROGRESSIVE CHARACTER OF PICTURES**

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Eric Link

(TYPED OR PRINTED NAME OF PERSON MAILING PAPER OR FEE)

(SIGNATURE OF PERSON MAILING PAPER OR FEE)

PRELIMINARY AMENDMENT

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

Prior to the calculation of fees and examination of the present application, please enter the amendments and remarks set out below.

In the Drawings:

Submitted herewith is a request for proposed drawing modification as indicated in red ink to label FIGS. 1-5 as prior art.

In the Title:

Please delete "HYSTOGRAMS" and substitute -- HISTOGRAMS -- therefor.

In the Claims:

Please cancel Claims 1 to 9.

Please add new Claims 10 to 40.

10. A method for processing a bitstream of coded data of video sequences of progressive or interlaced pictures, the method comprising:

estimating motion vectors of groups of pixels belonging to a top half-frame of a current picture in relation to pixels belonging to a bottom half-frame of a preceding picture;

estimating motion vectors of groups of pixels of a bottom half-frame of the current picture in relation to pixels belonging to the top half-frame of the current picture;

calculating for each macroblock of the top half-frame and the bottom half-frame a respective top motion coefficient and a bottom motion coefficient based upon the estimation of the motion vectors of the top half-frame and the bottom half-frame; and

recognizing the current picture as an interlaced picture by a substantial equality of a distribution of values of the motion coefficients, or as a progressive picture by a substantial inequality of the distributions of values of the motion coefficients.

11. A method according to Claim 10 wherein recognizing comprises:

comparing the top motion coefficients with a top threshold and comparing the bottom motion coefficients with a bottom threshold;

counting the motion vectors having motion coefficients lower than the top threshold of the top half-

frames and the bottom half-frames of the current picture for producing a pair of first and second coefficients; and

counting the motion vectors whose motion coefficients are greater than the bottom threshold of the top half-frames and the bottom half-frames of the current picture for producing a second pair of third and fourth coefficients;

wherein recognizing the current picture as progressive picture or an interlaced picture is based upon the first, second, third and fourth coefficients relative to the current picture and to the preceding pictures.

12. A method according to Claim 10 wherein the calculated values of the top and bottom motion coefficients are used to perform a preliminary test comprising:

summing the motion coefficients of macroblocks belonging to the top half-frame of the current picture for producing a top sum coefficient;

summing the motion coefficients of macroblocks belonging to the bottom half-frame of the current picture producing a bottom sum coefficient; and

defining the current picture as a progressive picture if the top sum coefficient and the bottom sum coefficient are lower than respective pre-established first and second positive numbers, otherwise proceeding with recognizing the current picture as an interlaced picture by the substantial equality of the distributions of values of the motion coefficients or as a progressive picture by the substantial inequality of the distributions of values of the motion coefficients.

13. A method according to Claim 10 wherein recognizing comprises:

calculating a pair of first and second shape coefficients representing distributions of the top and bottom motion coefficients, respectively;

wherein recognizing the current picture a progressive picture or an interlaced picture is based upon whether the shape coefficients differ by a quantity greater or lower than a certain value, respectively.

14. A method according to Claim 10 wherein recognizing further comprises:

calculating a coefficient representing a stochastic correlation between distribution of the top and bottom motion coefficients;

wherein recognizing the current picture a progressive picture or an interlaced picture is based upon whether the calculated coefficient exceeds a certain value.

15. A method according to Claim 11 further comprising:

calculating a first ratio between the first coefficient relative to the current picture and the second coefficient relative to the preceding picture;

calculating a second ratio between the second coefficient relative to the current picture and the first coefficient relative to the current picture;

calculating a third ratio between the third coefficient relative to the current picture and the fourth coefficient relative to the preceding picture;

calculating a fourth ratio between the fourth coefficient relative to a current picture and the third coefficient relative to the current picture; and

comparing the first, second, third and fourth ratios with respective pre-established third, fourth, fifth and sixth positive numbers recognizing the current picture as a progressive picture if the first and fourth ratios are lower than the third and sixth numbers, respectively, and if simultaneously the second and third ratios are greater than the fourth and fifth numbers, respectively.

16. A method according to Claim 15 further comprising:

dividing the first and second ratios for producing a fifth ratio; and

dividing the third and fourth ratios for producing a sixth ratio;

wherein recognizing the current picture as a progressive picture is based upon results of comparing and if simultaneously the fifth and sixth ratios are greater than pre-established seventh and eighth numbers.

17. A method according to Claim 10 further comprising:

calculating a temporary weight value for each elaborated picture as a function of a result of recognizing the current picture as a progressive or interlaced picture; and

calculating a final weight value for each elaborated picture as a function of the temporary weight value relative

to the current picture and of final weight values relative to preceding pictures;

wherein recognizing the current picture as a progressive or an interlaced picture depends on the temporary weight value relative to the current picture and on the final weight values relative to preceding pictures.

18. A method according to Claim 10 further comprising calculating motion vectors of a picture of the video sequences using a Frame-Prediction technique if the current picture is recognized as a progressive picture or using a Field-Prediction technique if the current picture is recognized as an interlaced picture.

19. A method according to Claim 10 wherein the video sequences are processed according to an MPEG standard.

20. A method for processing a bitstream of coded data of video sequences of progressive or interlaced pictures, the method comprising:

estimating motion vectors of groups of pixels belonging to a top half-frame of a current picture in relation to pixels belonging to a bottom half-frame of a preceding picture;

estimating motion vectors of groups of pixels of a bottom half-frame of the current picture in relation to pixels belonging to the top half-frame of the current picture;

calculating for each macroblock of the top half-frame and the bottom half-frame a respective top motion coefficient and a bottom motion coefficient based on the

estimation of the motion vectors of the top half-frame and the bottom half-frame; and

recognizing the current picture as an interlaced picture or as a progressive picture based upon distributions of values of the motion coefficients.

21. A method according to Claim 20 wherein a substantial equality of the distribution of values of the motion coefficients corresponds to an interlaced picture and a substantial inequality of the distributions of values of the motion coefficients corresponds to a progressive picture.

22. A method according to Claim 20 wherein recognizing comprises:

comparing the top motion coefficients with a top threshold and comparing the bottom motion coefficients with a bottom threshold;

counting the motion vectors having motion coefficients lower than the top threshold of the top half-frames and the bottom half-frames of the current picture for producing a pair of first and second coefficients; and

counting the motion vectors whose motion coefficients are greater than the bottom threshold of the top half-frames and the bottom half-frames of the current picture for producing a second pair of third and fourth coefficients;

wherein recognizing the current picture as progressive picture or an interlaced picture is based upon the first, second, third and fourth coefficients relative to the current picture and to the preceding pictures.

23. A method according to Claim 20 wherein the calculated values of the top and bottom motion coefficients are used to perform a preliminary test comprising:

summing the motion coefficients of macroblocks belonging to the top half-frame of the current picture for producing a top sum coefficient;

summing the motion coefficients of macroblocks belonging to the bottom half-frame of the current picture producing a bottom sum coefficient; and

defining the current picture as a progressive picture if the top sum coefficient and the bottom sum coefficient are lower than respective pre-established first and second positive numbers, otherwise proceeding with recognizing the current picture as an interlaced picture by the substantial equality of the distributions of values of the motion coefficients or as a progressive picture by the substantial inequality of the distributions of values of the motion coefficients.

24. A method according to Claim 20 wherein recognizing comprises:

calculating a pair of first and second shape coefficients representing distributions of the top and bottom motion coefficients, respectively;

wherein recognizing the current picture a progressive picture or an interlaced picture is based upon whether the shape coefficients differ by a quantity greater or lower than a certain value, respectively.

25. A method according to Claim 20 wherein recognizing further comprises:

calculating a coefficient representing a stochastic correlation between distribution of the top and bottom motion coefficients;

wherein recognizing the current picture a progressive picture or an interlaced picture is based upon whether the calculated coefficient exceeds a certain value.

26. A method according to Claim 21 further comprising:

calculating a first ratio between the first coefficient relative to the current picture and the second coefficient relative to the preceding picture;

calculating a second ratio between the second coefficient relative to the current picture and the first coefficient relative to the current picture;

calculating a third ratio between the third coefficient relative to the current picture and the fourth coefficient relative to the preceding picture;

calculating a fourth ratio between the fourth coefficient relative to a current picture and the third coefficient relative to the current picture; and

comparing the first, second, third and fourth ratios with respective pre-established third, fourth, fifth and sixth positive numbers recognizing the current picture as a progressive picture if the first and fourth ratios are lower than the third and sixth numbers, respectively, and if simultaneously the second and third ratios are greater than the fourth and fifth numbers, respectively.

27. A method according to Claim 26 further comprising:

dividing the first and second ratios for producing a fifth ratio; and

dividing the third and fourth ratios for producing a sixth ratio;

wherein recognizing the current picture as a progressive picture is based upon results of comparing and if simultaneously the fifth and sixth ratios are greater than pre-established seventh and eighth numbers.

28. A method according to Claim 20 further comprising:

calculating a temporary weight value for each elaborated picture as a function of a result of recognizing the current picture as a progressive or interlaced picture; and

calculating a final weight value for each elaborated picture as a function of the temporary weight value relative to the current picture and of final weight values relative to preceding pictures;

wherein recognizing the current picture as a progressive or an interlaced picture depends on the temporary weight value relative to the current picture and on the final weight values relative to preceding pictures.

29. A method according to Claim 20 further comprising calculating motion vectors of a picture of the video sequences using a Frame-Prediction technique if the current picture is recognized as a progressive picture or using a Field-Prediction technique if the current picture is recognized as an interlaced picture.

30. A method according to Claim 20 wherein the video sequences are processed according to an MPEG standard.

31. A video processor for processing a bitstream of coded data of video sequences of progressive or interlaced pictures, the video processor comprising:

a first estimator for estimating motion vectors of groups of pixels belonging to a top half-frame of a current picture in relation to pixels belonging to a bottom half-frame of a preceding picture;

a second estimator for estimating motion vectors of group of pixels of a bottom half-frame of the current picture in relation to pixels belonging to the top half-frame of the current picture;

a calculator for calculating for each macroblock of the top half-frame and the bottom half-frame a respective top motion coefficient and a bottom motion coefficient depending on the estimation of the motion vectors of the top half-frame and the bottom half-frame; and

a detector for recognizing the current picture as an interlaced picture or as a progressive picture based upon the distributions of values of the motion coefficients.

32. A video processor according to Claim 31 wherein a substantial equality of the distribution of values of the motion coefficients corresponds to an interlaced picture and a substantial inequality of the distributions of values of the motion coefficients corresponds to a progressive picture.

33. A video processor according to Claim 31 wherein said detector:

compares the top motion coefficients with a top threshold and comparing the bottom motion coefficients with a bottom threshold;

counts the motion vectors having motion coefficients lower than the top threshold of the top half-frames and the bottom half-frames of the current picture for producing a pair of first and second coefficients; and

counts the motion vectors whose motion coefficients are greater than the bottom threshold of the top half-frames and the bottom half-frames of the current picture for producing a second pair of third and fourth coefficients;

wherein said detector recognizes the current picture as a progressive picture or as an interlaced picture based upon the first, second, third and fourth coefficients relative to the current picture and to the preceding pictures.

34. A video processor according to Claim 31 wherein said third module for calculating values of the top and bottom motion coefficients performs a preliminary test comprising:

summing the motion coefficients of macroblocks belonging to the top half-frame of the current picture for producing a top sum coefficient;

summing the motion coefficients of macroblocks belonging to the bottom half-frame of the current picture producing a bottom sum coefficient; and

defining the current picture as a progressive picture if the top sum coefficient and the bottom sum coefficient are lower than respective pre-established first and second positive numbers, otherwise proceeding with

recognizing the current picture as an interlaced picture by the substantial equality of the distributions of values of the motion coefficients or as a progressive picture by the substantial inequality of the distributions of values of the motion coefficients.

35. A video processor according to Claim 31 wherein said detector:

calculates a pair of first and second shape coefficients representing distributions of the top and bottom motion coefficients, respectively;

said detector recognizes the current picture as a progressive picture or as an interlaced picture based upon whether the shape coefficients differ by a quantity greater or lower than a certain value, respectively.

36. A video processor according to Claim 31 wherein said detector:

calculates a coefficient representing a stochastic correlation between distribution of the top and bottom motion coefficients;

said detector recognizes the current picture as a progressive picture or as an interlaced picture based upon whether the calculated coefficient exceeds a certain value.

37. A video processor according to Claim 33 wherein said detector:

calculates a first ratio between the first coefficient relative to the current picture and the second coefficient relative to the preceding picture;

calculates a second ratio between the second coefficient relative to the current picture and the first coefficient relative to the current picture;

calculates a third ratio between the third coefficient relative to the current picture and the fourth coefficient relative to the preceding picture;

calculates a fourth ratio between the fourth coefficient relative to a current picture and the third coefficient relative to the current picture; and

compares the first, second, third and fourth ratios with respective pre-established third, fourth, fifth and sixth positive numbers recognizing the current picture as a progressive picture if the first and fourth ratios are lower than the third and sixth numbers, respectively, and if simultaneously the second and third ratios are greater than the fourth and fifth numbers, respectively.

38. A video processor according to Claim 31 wherein said detector:

divides the second and first ratios for producing a fifth ratio; and

divides the third and fourth ratios for producing a sixth ratio;

said detector recognizes the current picture as a progressive picture or as an interlaced picture based upon results of the comparing by said eighth sub-module and if simultaneously the fifth and sixth ratios are greater than pre-established seventh and eighth numbers.

39. A video processor according to Claim 31 wherein said detector:

calculates a temporary weight value for each elaborated picture as a function of a result of recognizing the current picture as a progressive or interlaced picture; and

calculates a final weight value for each elaborated picture as a function of the temporary weight value relative to the current picture and of final weight values relative to preceding pictures;

said detector recognizes the current picture as a progressive picture or as an interlaced picture based upon the temporary weight value relative to the current picture and on the final weight values relative to preceding pictures.

40. A video processor according to Claim 31 wherein the bitstream of coded data of video sequences are processed according to an MPEG standard.

REMARKS

It is believed that all of the claims are patentable over the prior art. Accordingly, after the Examiner completes a thorough examination and finds the claims patentable, a Notice of Allowance is respectfully requested in due course. Should the Examiner determine any minor informalities that need to be addressed, he is encouraged to contact the undersigned attorney at the telephone number below.

In re Patent Application of:
BAGNI ET AL.
Serial No. **Not Yet Assigned**
Filed: **Herewith**

Respectfully submitted,

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
BAGNI ET AL.

Serial No. **Not yet assigned**

Filing Date: **Herewith**

For: **PROCESSING OF MOTION VECTOR HYSTOGRAMS FOR RECOGNIZING THE INTERLEAVED OR PROGRESSIVE CHARACTER OF PICTURES**

SUBMISSION OF PROPOSED MODIFICATIONS TO DRAWINGS

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

Submitted herewith is a request for proposed drawing modifications as indicated in red ink to label FIGS. 1-5 as prior art.

Respectfully submitted,

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Eric Link
(TYPED OR PRINTED NAME OF PERSON MAILING PAPER OR FEE)

(SIGNATURE OF PERSON MAILING PAPER OR FEE)

FIG. 1 (PRIOR ART)

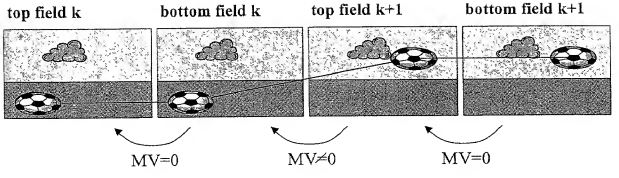

FIG. 2 (PRIOR ART)

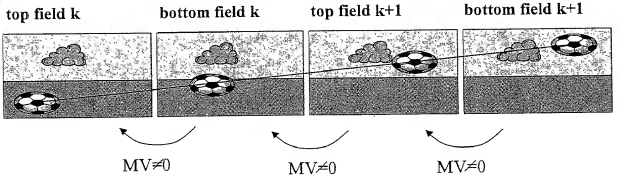

FIG. 3 (PRIOR ART)

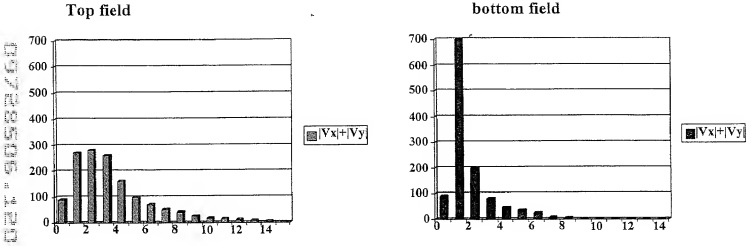

FIG. 4 (PRIOR ART)

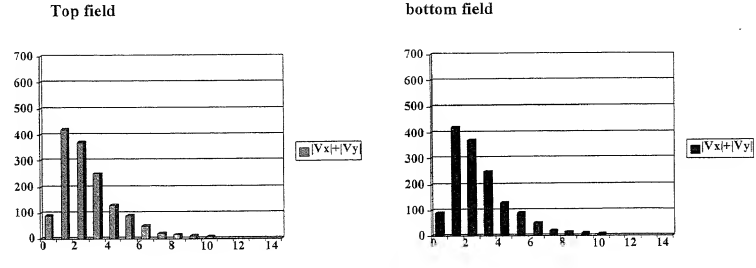

FIG. 5
(PRIOR ART)